EAST CASCADES ECOREGION

PHYSIOGRAPHY AND BIODIVERSITY

Geography

The East Cascades ecoregion in Washington lies east of the Cascade crest, from Sawtooth Ridge near Lake Chelan south to the Columbia Gorge. Its eastern border follows the montane forest – lowland shrub-steppe transition. Approximately 10 percent of Washington is included within this ecoregion. According to the Washington Gap Project, as of 1991, less than 2 percent of the Washington portion had been converted to agricultural or urban development. The development that has occurred is concentrated in the Chelan, Wenatchee, upper Yakima, and Little White Salmon valleys.

Geology

The East Cascades of Washington were shaped by alpine glaciers and landslides which created rugged ridges extending southeast to east from the Cascade crest. Broad valleys occupy the lowlands between the mountain ridges. Isolated volcanic cones appear on the steep mountain ridges, but with the exception of Mt. Adams are not as high as volcanoes in the Western Cascades. The East Cascades have a varied geology, including large serpentine areas in the Wenatchee Mountains. The typical elevation range is between 2,000 and 7,000 feet. Mt. Adams is the highest peak at 12,276 feet. The lowest elevation is in the Columbia River Gorge at 100 feet. The Wenatchee and Simcoe mountains are eastward extensions of this ecoregion.

Climate

The climate changes rapidly west to east, from cold with high precipitation (120 inches) along the Cascade crest to hot and dry with less than 20 inches per year along the foothills. Most precipitation accumulates from November through April. A snow pack develops at higher elevations.

Habitat and Plant Associations

Forests of grand fir, Douglas-fir and ponderosa pine dominate the East Cascades ecoregion. Oregon white oak woodlands appear at lower elevations in the southern half of the ecoregion, and subalpine fir, mountain hemlock and Engelmann spruce are found at higher elevations. Whitebark pine, lodgepole pine, and western larch are common components of these forests. Historically, fires occurred at irregular intervals from 10 years in the lowland foothills to 150 years or more at high elevations. Forest stand patterns on the landscape often reflect this complex fire history. In some areas, decades of fire suppression have resulted in large areas of dense, fire-prone forests. Shrub-steppe vegetation composed of big sagebrush or antelope bitterbrush and native bunchgrasses occurs along the foothills and higher south-facing slopes.

Biodiversity

Large mammals include elk, blacktail and mule deer, cougar and black bear. Mountain goats inhabit high elevations in the central and northern part of the ecoregion, but are largely absent from the southern portion of their range. Fisher, once common in this ecoregion, are now rare or extirpated. Blue and ruffed grouse, owls, hawks, and songbirds are common. Pileated woodpeckers and other cavity nesters are common. The wetlands are home to many waterfowl such as Canada geese, ducks, herons, and various song birds. Bald and golden eagles inhabit a small portion of their historic ranges and are very limited in distribution. The peregrine falcon is making a comeback in the ecoregion. Anadromous fish such as coho and chinook salmon and steelhead inhabit the streams and rivers, their distribution and numbers are significantly reduced. Rainbow and cutthroat trout are the common cold water inhabitants. Bull trout are found, but their occurrence is significantly restricted from historic ranges. Kokanee are particularly associated with lakes in the northern and central portions of this ecoregion.

LAND OWNERSHIP

The single largest landowner in the East Cascades ecoregion is the U.S. government. Most of the federal land is within the Wenatchee National Forest. Major landowners in the East Cascades ecoregion are the U.S. Forest Service, the Yakama Nation, Washington Department of Natural Resources, Washington Department of Fish and Wildlife, and private timber companies. The Washington Department of Fish and Wildlife manages about 113,267 acres in the ecoregion, including the Colockum, Oak Creek, L.T. Murray, Wenas, and Chelan Butte Wildlife Areas. Dominant land uses are forestry, livestock grazing, recreation and conservation. Timber companies have recently begun to sell lands for development in the non-federal, mid-elevation forest and transition zone.

Although less than 25% of the ecoregion is privately owned, nearly two-thirds of the anadromous streams, primarily lower gradient streams, are bordered by private lands along the mainstems of the Wenatchee, Naches and Yakima Rivers.

ECOREGIONAL CONSERVATION PARTNERSHIPS

Effective conservation of fish, wildlife and biodiversity in Washington requires close coordination and cooperation with many public and private conservation partners. Major partners in the East Cascades ecoregion include:

- USDA Forest Service (Wenatchee National Forest)
- Washington Department of Natural Resources
- U.S. Fish and Wildlife Service (Pierce and Conboy Lake National Wildlife Refuges)
- U.S. Bureau of Reclamation
- Yakama Indian Nation

The Washington Department of Fish and Wildlife also works closely on conservation projects with private conservation partners such as The Nature Conservancy, Audubon Washington, Ducks Unlimited, public-private partnerships such as the Intermountain West Joint Venture, The Rocky Mountain Elk Foundation and a growing number of local land trusts.

Major Plans

A number of major planning efforts involving WDFW and its public and private partners are ongoing or completed that influence and guide the conservation and management of fish and wildlife resources in the East Cascades. Included among these major efforts are:

- East Cascades Ecoregional Assessment
- Yakima, Lake Chelan, Wenatchee and Klickitat Subbasin Plans
- Interior Columbia Basin Ecosystem Management Project (ICBEMP)
- Intermountain West Joint Venture: Coordinated Implementation Plan for Bird Conservation in Eastern Washington (2005)
- Northwest Forest Plan
- USFWS Grizzly Bear Recovery Plan (1993)
- Northern Rocky Mountain Wolf Recovery Plan (1991)
- Fisher Recovery Plan (2004)
- Northern Spotted Owl Recovery Plan (1992)
- Western Gray Squirrel Recovery Plan (2004)
- Western Pond Turtle Recovery Plan (1999)

- National Wildlife Refuge Comprehensive Conservation Plans (in progress)
- Outline for Salmon Recovery Plans (2003)
- Bull Trout and Dolly Varden Management Plan (2000)

Supporting references to these and other important planning documents are included at the end of this chapter and/or in Appendix **.

SPECIES AND HABITATS OF GREATEST CONSERVATION NEED

*This section provides a short summary of priority species and habitats for the Washington portion of the East Cascades ecoregion. Supporting tables and information for these species and habitats can be found in Appendix **.*

Species of Greatest Conservation Need (SGCN)

The following species list for the East Cascades ecoregion includes those statewide Species of Greatest Conservation Need (see Appendix **) found in the ecoregion for all or part of their lifecycle, including some target species of the East Cascades Ecoregional Assessment. Supporting tables and information for these species and habitats can be found in Appendix **).

COMMON NAME	SCIENTIFIC NAME	State Status
Mammals		
Pallid Townsend's big-eared bat	*Corynorhinus townsendii pallascens*	C
Townsend's ground squirrel ssp.	*Spermophilus townsendii townsendii*	C
Western gray squirrel	*Sciurus griseus*	T
Gray wolf	*Canis lupus*	E
Grizzly bear	*Ursus arctos*	E
Fisher	*Martes pennanti pacifica*	E
Wolverine	*Gulo gulo*	C
American badger	*Taxidea taxus*	
Mountain goat	*Oreamnos americanus*	
Birds		
Common loon	*Gavia immer*	S
Western grebe	*Aechmophorus occidentalis*	C
Great blue heron	*Ardea herodias*	M
Harlequin duck	*Histrionicus histrionicus*	
Northern goshawk	*Accipiter gentilis*	C
Golden eagle	*Aquila chrysaetos*	C
Flammulated owl	*Otus flammeolus*	C
Northern spotted owl	*Strix occidentalis caurina*	E

COMMON NAME	SCIENTIFIC NAME	State Status
Great gray owl	*Strix nebulosa*	M
Vaux's swift	*Chaetura vauxi*	C
Lewis' woodpecker	*Melanerpes lewis*	C
White-headed woodpecker	*Picoides albolarvatus*	C
Black-backed woodpecker	*Picoides arcticus*	C
Pileated woodpecker	*Dryocopus pileatus*	C
Pygmy nuthatch	*Sitta pygmaea*	
Loggerhead shrike	*Lanius ludovicianus*	C
Reptiles		
Western pond turtle	*Actinemys (Clemmys) marmorata*	E
Sharptail snake	*Contia tenuis*	C
California mountain kingsnake	*Lampropeltis zonata*	C
Amphibians		
Tiger salamander	*Ambystoma tigrinum*	M
Larch Mountain salamander	*Plethodon larselli*	S
Western toad	*Bufo boreas*	C
Oregon spotted frog	*Rana pretiosa*	E
Columbia spotted frog	*Rana luteiventris*	C
Fish		
River lamprey	*Lampetra ayresi*	C
Pacific lamprey	*Lampetra tridentata*	
Westslope cutthroat	*Oncorhynchus clarki lewisi*	
Mid-Columbia steelhead	*Oncorhynchus mykiss*	
Yakima steelhead	*Oncorhynchus mykiss*	
Inland redband trout	*Oncorhynchus mykiss gairdneri*	
Mid-Columbia coho	*Oncorhynchus kisutch*	
Leopard dace	*Rhinichthys falcatus*	C
Mountain sucker	*Catostomus platyrhynchus*	C
Invertebrates		
Propertius' duskywing butterfly	*Erynnis propertius*	M
Mardon skipper butterfly	*Polites mardon*	E
Chinquapin hairstreak butterfly	*Habrodais grunus herri*	C
Juniper hairstreak butterfly	*Mitoura grynea barryi*	C

In ranking species for the Species of Greatest Conservation Need (SGCN) list, all ecoregional assessment target species were considered, but not all ranked high enough to be on the SGCN list. A complete list of East Cascades ecoregional assessment target species can be referenced in the East Cascades Ecoregional Assessment link on the CWCS website.

Species Conservation in the East Cascades Ecoregion

Species of Greatest Conservation Need (SGCN) found in the East Cascades ecoregion (see table above) include those classified by WDFW as Endangered, Threatened, Candidate or Monitor species, as well as species identified by WDFW as needing additional research or funding attention. A range of conservation actions are recommended for these SGCN species at both the statewide and ecoregional levels. These recommended conservation actions are summarized in a series of matrices included as an appendix of the CWCS. The matrices also display the life history, population status and distribution of these species.

Ecoregion Habitat Overview

Most natural habitats in the East Cascades ecoregion are relatively intact and dominated by natural or semi-natural vegetation. Over a century of timber harvest however, has degraded dry forests through consistent removal of large-diameter overstory trees, particularly ponderosa pine. These forests contain two of Washington State's highest concentrations of rare plants, located in the Columbia River Gorge and the Wenatchee Mountains. The southern portion of the ecoregion contains fescue grasslands, which harbor the Mardon skipper, a Washington state endangered species and federal candidate butterfly more commonly associated with the Puget Trough.

(A MAP OF WHROW HABITATS IN THE ECOREGION WILL BE INSERTED HERE)

The following habitat types, which are classified, coded and described in Wildlife and Habitat Relationships in Oregon and Washington (WHROW), are present in the East Cascades ecoregion. In the next section, descriptions are provided for some of the critical habitats for the Species of Greatest Conservation Need.

- Westside Lowlands Conifer-Hardwood Forest
- Montane Mixed Conifer Forest
- Eastside (Interior) Mixed Conifer Forest
- Lodgepole Pine Forest and Woodlands
- Ponderosa Pine and Eastside White Oak Forest and Woodlands
- Upland Aspen Forest
- Subalpine Parkland
- Alpine Grasslands and Shrublands
- Shrub-steppe
- Dwarf Shrub-steppe
- Agriculture, Pasture and Mixed Environs
- Urban and Mixed Environs
- Open Water: Lakes, Rivers and Streams
- Herbaceous Wetlands
- Montane Coniferous Wetlands
- Eastside (Interior) Riparian-Wetlands

Priority Habitats in the East Cascades Ecoregion

The following five habitat types have been identified as the highest priority for conservation action in the East Cascades ecoregion. Selection of these habitats was determined by their importance to regional Species of Greatest Conservation Need, as well as other factors. Open Water was included as a high priority in this ecoregion because of the great importance of the Columbia and Yakima Rivers and their tributaries to Northwest salmon recovery.

- Ponderosa Pine and Eastside White Oak Forest and Woodlands
- Montane and Interior Mixed-Conifer Old Growth Forest
- Shrub-steppe
- Montane Coniferous Wetlands
- Eastside (Interior) Riparian-Wetlands

Ponderosa Pine and Eastside White Oak Forest and Woodlands

Ponderosa pine/Oregon white oak woodland habitats are unique dry forest ecosystems in the East Cascades ecoregion, due to the rain shadow and topography of the east slope of the Cascades. Oregon white oak woodlands exist to a lesser extent than ponderosa pine in the East Cascades ecoregion, and are an important and unique habitat. Both occupy about 16% of the ecoregion.

Ponderosa pine forms climax stands that border grasslands and is a common member in many other forested communities. It is a drought tolerant tree that usually occupies the transition zone between grassland and forest. Climax stands are characteristically warm and dry, and occupy lower elevations throughout their range. Key understory associates in climax stands typically include grasses such as bluebunch wheatgrass and Idaho fescue, and shrubs such as bitterbrush and common snowberry.

Ponderosa pine has many fire resistant characteristics. Seedlings and saplings are often able to withstand fire. Pole-sized and larger trees are protected from the high temperatures of fire by thick, insulating bark, and stems are protected by the surrounding needles and bud scales. Other aspects of the pine's growth patterns help in temperature resistance. Lower branches fall off the trunk of the tree, and fire caused by the fuels in the understory will usually not reach the upper branches. Ponderosa pine is more vulnerable to fire at more mesic sites where other conifers as Douglas-fir, and Grand fir form dense understories that can carry fire upward to the overstory. Ponderosa pine seedlings germinate more rapidly when a fire has cleared the grass and the forest floor of litter, leaving only mineral rich soil.

Ponderosa pine is also shade intolerant and grows most rapidly in near full sunlight. Currently, much of this habitat has a younger tree cohort of more shade-tolerant species that gives the habitat a more closed, multi-layered canopy. For example, this habitat includes previously natural fire-maintained stands in which grand fir can eventually become the dominant canopy species. Large late-seral ponderosa pine and Douglas-fir are harvested for timber in much of this habitat. Oregon white oak is frequently cut for fuel wood, or removed during thinning as competition with desired timber species. Under most management regimes, typical tree size decreases and tree density increases in this habitat. Ponderosa pine-Oregon white oak habitats are now denser than in the past and may contain more shrubs than in pre-settlement habitats.

Selected Species Closely Associated with Ponderosa Pine Forest and Woodlands in the East Cascades Ecoregion

Flammulated owl	Great gray owl
Northern goshawk	Western gray squirrel
Pygmy nuthatch	White-headed woodpecker

***Conservation Problems*:** Ponderosa pine is in major decline in the East Cascades ecoregion of Washington State, especially mature pine forests. In fact, it is estimated that 99% of the mature ponderosa pine forest has been lost to a number of factors, including direct habitat loss from rural residential and recreational development; encroachment of mixed conifer forest into mature ponderosa pine forests; and loss of old forest overstory due to logging. Weeds are an issue in some areas where extensive road networks have led to the establishment of knapweed and other exotics. Overgrazing in some portions of the dry forest causes extensive damage to wet areas, including springs and small streams.

Stand conversion is the principal cause of habitat diversity loss in this ecoregion. Historic conditions have been heavily altered by the loss of large overstory trees and the proliferation of shade-tolerant, mixed forest conifer species, particularly grand fir, within ponderosa pine communities. Fire suppression policies that preclude the natural, low-intensity fire cycles favored by ponderosa pine and Oregon white oak are the most serious cause of this unintentional recruitment of less desirable species.

The *direct loss and fragmentation* of mature ponderosa pine and Oregon white oak habitat, coupled with poor quality of remaining forest habitat (i.e., lack of old-growth forest and associated large-diameter trees and snags) as well as high-intensity wildfires in replacement mixed conifer forest stands, have resulted in an attendant reduction in ponderosa pine habitat-obligate wildlife species.

Harvest practices have also contributed to loss of forest diversity through direct removal of older stands, as well as snags, downed wood and large overstory trees across the landscape. Snag habitat is a critical attribute of mature and old-growth forests. Unregulated logging and firewood cutting has resulted in a severe shortage of snag habitat, especially large snags, in the East Cascades. To a lesser extent, a significant reduction has also occurred in mature stands of Oregon white oak and wildlife species dependent on those forests.

***Conservation Actions**:* Species-level conservation and forest health is the primary focus of conservation in the forested portions of the ecoregion.

- Use the East Cascades Ecoregional Assessment to identify important ponderosa pine and Oregon white oak habitats and areas of high biodiversity on the east slope of the Cascades.
- Identify areas where thinning or prescribed burning would most successfully result in eventual regeneration of mature ponderosa pine and Oregon white oak stands.
- Promote the increased use of prescribed burning on public lands to reduce competition from mixed conifer forest species and create ideal conditions for ponderosa pine regeneration.
- Promote prescribed burning and selective logging and thinning of invasive mixed conifer forest on private forestlands to promote regeneration of mature ponderosa pine and white oak stands.

- Encourage the protection of mature stands of ponderosa pine and Oregon white oak, as well as critical snag habitat, from overharvest through a variety of regulatory and non-regulatory avenues on both public and private lands.
- Work with Yakima County, Chelan County, Kittitas County, Klickitat County and other local governments in the ecoregion to identify areas of important forest habitat and biodiversity and protect these areas from residential and recreational development through the Growth Management Act and other regulations.
- Work with the Forest Service and other public land management agencies to identify and protect areas of important forest habitat and biodiversity from overuse and degradation from off-road recreational vehicle use and overgrazing.
- Work with private landowners to identify and protect areas of important mature forest habitat and biodiversity and protect these areas through landowner incentives and other nonregulatory programs.
- Encourage the development of selective harvest policies and guidelines on both public and private forest land that will leave adequate snags and downed wood as habitat for associated wildlife such as flammulated owls and white-backed woodpeckers.
- Coordinate citizen science monitoring and volunteer opportunities.

Montane and Interior Mixed-Conifer Old Growth Forest

This habitat makes up most of the continuous montane forests of the inland Pacific Northwest. It contains a wide array of tree species and stand dominance patterns. Douglas-fir is the most common tree species. It is almost always present and dominates or co-dominates most overstories. Low elevations or drier sites may have ponderosa pine co-occurring with Douglas-fir in the overstory and often have other shade-tolerant tree species growing in the undergrowth. On moist sites, grand fir, western redcedar and western hemlock occur. Other conifers include western larch and western white pine.

In the Eastern Cascades ecoregion, the remaining patches of old-growth forests of ponderosa pine, western larch, and Douglas-fir are home to a variety of wildlife including goshawk, martens, and northern spotted owls. Old growth forests of ponderosa pine, western larch, and Douglas-fir in this ecoregion are threatened by logging. Old growth Ponderosa forests are now very rare.

Prior to European settlement (pre-1850), a wide variety of disturbances characterized this habitat, ranging from frequent small-scale and localized events such as treefall gaps to rare, large-scale events such as stand-replacing fires and epizootic outbreaks. Such disturbances resulted in a dynamic equilibrium between patch creation and loss. This active disturbance regime has resulted in a larger proportion of younger seral stages than in areas west of the Cascade Mountains. However, the low-elevation (2900-4900 ft) forests, which experienced frequent low-intensity fires, were predominantly (up to 90%) old growth ponderosa pine. In general, forest ecosystems in this region are adapted to more frequent fire disturbances than mesic westside forests. Fire cycles range from periodic (5-15 years) surface fires in dry and warm ponderosa pine and Douglas-fir types, to infrequent (more than 100 yrs and up to 900+ yrs) stand-replacement crown fires in mesic and cool western redcedar, western hemlock, and cedar/spruce forest types. Such disturbances played a crucial role in maintaining inland forest structure, species composition, and ecosystem processes. However, logging and fire suppression have shifted disturbance regimes and landscape dynamics to less frequent and more intense fires, and frequent and large-scale anthropogenic disturbances have disrupted natural processes and led to declines in various ecosystem types and species.

Selected Species Closely Associated with Montane and Interior Mixed-Conifer Forest in the East Cascades Ecoregion

Fisher	Flammulated owl
Northern goshawk	Northern spotted owl
Wolverine	Pileated woodpecker

Conservation Problems: This habitat has been most affected by timber harvesting and fire suppression.

Timber harvesting has focused on large shade-intolerant species in mid and late seral forests, leaving shade-tolerant species.

Fire suppression enforces those logging priorities by promoting less fire- resistant, shade-tolerant trees. The resultant stands at all seral stages tend to lack snags, have high tree density, and are composed of smaller and more shade-tolerant trees. Late-seral forests of shade-intolerant species are now essentially gone. Early seral forest abundance is similar to that found historically but lacks snags and other old-growth features. Roads, timber harvest, periodic grazing, and altered fire regimes have compromised this habitat. Even though this habitat is more extensive than pre-1900, natural processes and functions have been modified enough to alter its natural status as functional habitat for many species.

Conservation Actions:

- Use the East Cascades Ecoregional Assessment to identify important old growth habitats and areas of high biodiversity on the east slope of the Cascades.
- Encourage the protection of old growth stands as well as critical snag habitat from overharvest through a variety of regulatory and non-regulatory avenues on both public and private lands.
- Work with Yakima County, Chelan County, Kittitas County, Klickitat County and other local governments in the ecoregion to identify areas of old growth habitat and biodiversity and protect these areas from residential and recreational development through the Growth Management Act and other regulations.
- Work with the Forest Service and other public land management agencies to identify and protect areas of important old growth habitat and biodiversity from overuse and degradation from off-road recreational use and overgrazing.
- Work with private landowners to identify and protect areas of important old growth forest habitat and biodiversity and protect these areas through landowner incentives and other non-regulatory programs.
- Encourage the development of selective harvest policies and guidelines on both public and private forest land that will leave adequate components of old growth habitat such as snags and downed wood as habitat for associated wildlife.
- Protection of existing old-growth should benefit Vaux's swifts, along with managing forest stands on long rotations (>200 years) and maintaining large hollow snags and live trees.

Shrub-steppe

Historically, shrub-steppe vegetation associations were commonly interspersed with one another forming a diverse mosaic at lower elevations of the East Cascades ecoregion. The combination of elevation, aspect, soil type, and proximity to surface and/or ground water contributed to the vegetation potential of any given site. Fire was likely the primary disturbance factor for native shrub-steppe communities, with intervals ranging between 50 and 100 years. Large mammals such as elk, small mammals such as ground squirrels, and flooding in perennial and ephemeral streams probably contributed secondary localized disturbance roles. Shrubs and perennial bunchgrasses co-dominated the lower-elevation landscape, with a microbiotic crust of lichens, mosses, green algae, and microfungi on the surface of the soil. Because they bind soil particles together, biotic crusts are critical for protecting the soil from wind and water erosion, fixing nitrogen, accumulating nutrients used by vascular plants, and out-competing invasive species. The dominant native shrub-grass association in the East Cascades of Washington is Wyoming big sagebrush and bluebunch wheatgrass.

Scattered throughout this dominant cover type were many other bunchgrasses including Sandberg's bluegrass, needle and thread, Thurber's needle grass, Idaho fescue, Indian rice grass, squirreltail, and Cusick's bluegrass. Scattered shrubs also included two rabbitbrush species and short-spine horsebrush, Antelope bitterbrush, spiny hopsage, rigid sagebrush, basin sagebrush and three-tip sagebrush. Most of these shrub species had their own unique association with one or more bunchgrasses and dominated a portion of the landscape. For example, at higher elevations and north facing slopes three-tip sagebrush and Idaho fescue was the dominant association. On ridge tops where shallow soils were common, rigid sagebrush and Sandberg's bluegrass and/or bluebunch wheatgrass dominated. Rabbitbrush was common in areas where fires had recently burned. Within the shrub steppe landscape there also were alkaline adapted community types, usually associated with drainage bottoms, perennial and ephemeral streams, or seeps and springs. This vegetation association, more common to the Great Basin than the Cascades, included black greasewood, basin wildrye, and inland saltgrass.

It has been estimated that only 40 percent remains of the roughly 10.4 million acres of shrub-steppe that once existed in Washington prior to the 1850s, substantially reducing the amount of habitat available for shrub-steppe-associated wildlife. The greater sage grouse, for example, requires large landscapes for cover and forage. Bunchgrasses conceal nests and provide cover for broods. Pre-nesting hens and young chicks consume forbs and associated insects. The Brewer's sparrow needs dense sagebrush for nesting and post-fledging success. Although they do not require large landscapes typically associated with sage grouse, breeding success has been shown to decrease as patch size decreases. Mule deer migrate to shrub-steppe habitat in fall and winter, depending on a variety of native shrubs, forbs, and grasses.

The loss of once extensive shrub-steppe communities has reduced substantially the habitat available to a wide range of shrub-steppe associated wildlife, including several birds found only in this community type. More than 100 bird species forage and nest in sagebrush communities, and at least four of them--the greater sage-grouse, sage thrasher, sage sparrow and Brewer's sparrow--are obligates.

Selected Species Closely Associated with Shrub-steppe in the East Cascades Ecoregion

American badger	Loggerhead shrike
Townsend's ground squirrel	Mardon skipper butterfly

***Conservation Problems*:**

The *direct loss and fragmentation* of habitat from grazing, agricultural development, residential and recreational development and off-road recreational activities is the most significant conservation problem in shrub-steppe habitat in the East Cascades ecoregion. The loss and fragmentation of habitat has resulted in a direct loss and reduced population viability of remaining populations of sage-grouse, Brewer's sparrows and other shrub-steppe obligate wildlife. Fragmentation and the loss of migration corridors is a particularly severe problem for shrub-steppe dependent wildlife in the East Cascades ecoregion.

Exotic species. The invasion of cheatgrass and other exotic plant species, brought on primarily by overgrazing and the alteration of natural fire regimes, is the second most important problem in shrub-steppe habitat. Exotic species displace native grasses and understory vegetation, resulting in the loss of habitat diversity and function. This is a problem on both public and private lands. Overgrazing has a doubly adverse impact, not only eliminating native grasses but also breaking down and destroying the microbiotic soil crust that supports native grasses and shrubs.

***Conservation Actions*:** Residential development, control of invasive exotics, and agricultural practices including rangeland degradation are at the center of conservation in the southern portion of the ecoregion.

- Use the East Cascades Ecoregional Assessment to identify important shrub-steppe habitat, habitat corridors and areas of high biodiversity on the east slope of the Cascades.
- Work with Yakima and Chelan Counties and other local governments in the ecoregion to identify areas of important shrub-steppe habitat and biodiversity and protect these areas through the Growth Management Act and other local regulations.
- Work with the Bureau of Land Management, Washington DNR and other public and tribal land management agencies to identify and protect important shrub-steppe habitat and areas of high biodiversity from degradation due to off-road recreational vehicle use and overgrazing. Promote the restoration of degraded shrub-steppe habitat on public lands.
- Work with private landowners to identify important shrub-steppe habitat and areas of high biodiversity and to protect and restore these areas through landowner incentives and other nonregulatory programs.
- Identify and assess key connectivity areas between fragmented shrub-steppe habitats.
- Identify areas of high-quality shrub-steppe habitat that need permanent protection as habitat for sage-grouse and other shrub-steppe dependent wildlife.
- Acquire easements or fee title ownership from interested and willing landowners in targeted habitat protection and habitat connectivity areas.

- Work to improve the policy options and financial ability of public agencies and landowners to control fires, weeds, overgrazing and off-road recreational use in shrub-steppe habitat.
- Preserve areas of native shrub-steppe important for burrowing mammal species (e.g., ground squirrels and badgers) that create nesting habitat for burrowing owls. Colonies of burrowing mammals should be preserved in areas where burrowing owls occur.
- Promote and fund native plant restoration in selected public and private habitat.

Eastside (Interior) Riparian-Wetlands

In the East Cascades ecoregion, riparian forest habitats are critical to the structure and function of rivers and to the fish and wildlife populations dependent on them. The density and diversity of wildlife in these riparian areas is high relative to other habitat types. Riparian habitats are strongly influenced by associated stream dynamics and hydrology; to remain viable, they require appropriate flooding regimes and specific substrate conditions for native riparian vegetation. Historically, annual flood cycles and associated groundwater dynamics created thermal conditions that were conducive to riparian habitat and wildlife use throughout the season. Fire also influenced riparian habitat structure in most areas, but was nearly absent in colder regions or on topographically protected streams. River meander patterns, ice and log jams, sediment dynamics and flood debris deposits also provided spatial and temporal changes in habitat condition. Abundant beaver activity in riparian zones cropped younger cottonwoods and willows, dammed side channels, and created diverse and complex habitat interactions.

Healthy forested riparian wetland habitat has an abundance of snags and downed logs that are critical to many cavity nesting birds, mammals, reptiles and amphibians. Cottonwood, alder and willow are commonly dominant tree species in riparian wetland areas from the Cascades down through the valley portion of the ecoregion. This habitat is often characterized by relatively dense understory and overstory vegetation. Riparian wetland habitats also function as travel corridors between, and provide connectivity to breeding, feeding and seasonal ranges.

Although riparian-wetland habitats are usually forested, they also contain important habitat components such as marshes and ponds that provide critical habitat for a number of wildlife species. Broad floodplain mosaics consisting of cottonwood gallery forests, shrub lands, marshes, side channels, and upland grass areas contain diverse wildlife assemblages. The importance of riparian wetland habitats is increased when adjacent habitats are of sufficient quality and quantity to provide cover for nesting, roosting, and foraging.

Riparian conditions in the East Cascades ecoregion are varied, ranging from severely degraded to nearly pristine. Good riparian habitat generally is found along forested, headwater reaches, whereas degraded stream channels and riparian habitat is concentrated in the valleys, where it is frequently associated with residential development, grazing and agricultural activity. Recreational development is also having an increasing impact, especially along the upper Yakima River in the critical reach from the city of Cle Elum to Easton Dam.

Selected Species Closely Associated with Eastside (Interior) Riparian-Wetlands in the East Cascades Ecoregion

Columbia spotted frog	Great blue heron
Harlequin duck	Pygmy nuthatch
Tiger salamander	Western toad

***Conservation Problems*:** Riparian-wetlands have been lost or degraded on a large scale in the East Cascades ecoregion. The most severe long-term problem, on a regional scale, is the direct conversion and fragmentation of riparian habitat to homes, commercial buildings, and other permanent structures. The construction of levees and streambank armoring also results in a permanent loss of habitat in most cases. Once streamside habitat is lost to concrete or lawn, it is usually gone forever, and once a riparian corridor is fragmented by development its utility for wildlife movement is severely compromised or eliminated.

The second most severe problem is the loss of riparian habitat diversity and complexity from a combination of abuses, including overgrazing, channelization, gravel mining, unauthorized roading and off-road recreational use, dumping, and the elimination of beaver from overtrapping and habitat loss. This, coupled with poor habitat quality and fragmentation of existing vegetation, has resulted in extirpation or significant reductions in riparian habitat-obligate wildlife species.

***Conservation Actions*:** Objectives and strategies recommended to restore riparian wetland habitat for terrestrial species are essentially the same as those for restoring floodplain habitat for fish. The main objective is to create adequate hydrological conditions to reconnect habitats in both tributary and mainstem floodplain areas throughout the ecoregion and to encourage the regeneration of native riparian vegetation in areas that have been degraded by invasive plant species. Recommended conservation actions include:

- Work with the Forest Service, Washington DNR and other public and tribal and management agencies to fence or otherwise protect riparian zones from livestock grazing and unauthorized offroad vehicle use.
- Work with Yakima County, Chelan County, Klickitat County and other local governments in the ecoregion to protect riparian habitat from destruction or degradation due to residential and recreational development through enforcement of the Growth Management Act and other regulations
- Ensure the integrity of riparian habitat by maintaining adequate riparian management zones (RMZs) along streams in all logging sites, on both public and private land.
- Ensure that all logging and forest access roads are located in stable, non-erodible areas and outside RMZs.
- Protect habitat quality in riparian corridors by controlling the timing and intensity of livestock grazing on public land and, through regulation and landowner agreements, on private land.
- Identify and provide special protection for riparian zones bordering important spawning and rearing areas.
- Work with private landowners to identify and protect riparian zones on their lands through landowner incentives and other nonregulatory programs.
- Provide funding, incentives and technical assistance to private landowners to eliminate undesirable invasive plant species in riparian zones and to restore native species that provide important habitat for native fish and wildlife.

- Inform public and private landowners about best management practices and means of restoring and managing native habitat communities in riparian zones.
- Purchase water rights from willing sellers in unregulated tributaries; use these water rights to restore and maintain adequate year-round flows for both instream and out-of-stream riparian fish and wildlife habitat.
- Acquire easements or fee title ownership from interested and willing landowners in targeted habitat protection and habitat connectivity areas.
- Restore stream connectivity, floodplain functions and riparian habitat in downstream tributaries of the Yakima River such as Satus Creek and Toppenish Creek.

Montane Coniferous Wetlands

In the forest zone of the East Cascades ecoregion, montane coniferous wetlands provide important ecological and hydrologic function disproportionate to their size on the landscape. They are positioned at the headwaters of many important river tributaries and aid in the collection and slow delivery of snowmelt to the region's rivers and streams. These wetlands also provide critical habitat for many specialized plant and animal species.

This habitat is typified as forested wetlands or floodplains with a persistent winter snow pack, and the topography includes everything from steep mountain slopes to nearly flat valley bottoms. Subsurface water flow within the rooting zone of these wetlands is common on slopes with impermeable soil layers, and flooding regimes range from saturated to seasonally and temporarily flooded. Seeps and springs are common.

These wetlands occur along stream courses or as small patches within a matrix of montane mixed conifer forest, or less commonly, eastside mixed conifer forest or lodgepole pine forest and woodlands. They also can occur adjacent to and intermixed with other wetland habitats, particularly riparian wetlands and herbaceous wetlands, and occur within a forest or woodland dominated by evergreen conifer trees. Deciduous broadleaf trees are occasionally co-dominant, and the understory is dominated by shrubs (most often deciduous and relatively tall), forbs or grasses. Areas of herbaceous vegetation may occur in forested wetlands, often with conifers encroaching along the edges of wet meadows and wetlands.

Selected Species Closely Associated with Montane Coniferous Wetlands in the East Cascades Ecoregion

Western toad

Wolverine

***Conservation Problems*:** Flooding, debris flow, fire and wind are the major natural disturbances to montane wetlands. Many of these areas are seasonally or temporarily flooded, and heavy floods reshape stream channels and riparian surfaces, which in turn create opportunities for recruitment and redistribution of woody debris. Montane wetland habitats are commonly invaded by undesirable exotic plant species due to overgrazing, altered fire frequencies and off-road vehicle use, as well as altered hydrology due to poorly designed roads, culverts and unregulated off-road vehicle use. These factors also encourage the encroachment of trees into herbaceous wetland habitats. The vegetative condition of riparian wetlands and meadows has been degraded, resulting in impaired hydrologic functions, especially those occurring in unregulated tributaries.

***Conservation Actions*:**

- Work with the Forest Service and other public and tribal land management agencies to fence or otherwise protect wetlands from livestock grazing and unauthorized recreational vehicle use.
- Work with private landowners to identify and protect wetlands on their lands through landowner incentives and other nonregulatory programs.
- Provide funding, incentives and technical assistance to public and private landowners to eliminate undesirable invasive wetland plant species, including trees, and restore native species that provide important habitat for native fish and wildlife.
- Implement controlled burns in meadows that suffer from tree encroachment.
- Relocate or modify roads that negatively impact publicly-owned montane wetlands.
- Eliminate vehicular access and campsites in conservation areas identified as critical montane coniferous wetland habitat.